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SCIENTIFIC DATA REVIEWS
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OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

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MEMORANDUM

Subject: Reregistration of **Mancozeb**: Storage Stability and Crop Field Trial Data for Bananas, Cotton, Cranberries, Dry Bulb Onions, Grapes, Pears, and Sugar Beets; Chemical No. 14504; DP Barcodes D252614, D252618, D252679, D252689, D252691, D252692, and D271640; MRID Nos.: 44726001, 44725701, 44730801, 44725501, 44725901, 44725101, and 44038801

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The Mancozeb Task Force has submitted storage stability and crop field trial studies to support the reregistration of the fungicide mancozeb for use on bananas, cotton, cranberries, dry bulb onions, grapes, pears, and sugar beets. This study has been reviewed by Dynamac Corporation under supervision of HED and the review has been revised to reflect Division policies.

No additional storage stability or crop field trial data are required to support the reregistration of mancozeb on bananas, cranberries, grapes, pears, and sugar beet tops/roots. Storage stability

IMAGE 10

data are required to support the magnitude of residue study in dry bulb onions. Magnitude of residue data remain outstanding for cotton gin by products for the Section 24(c) and Section 3 registrations, as described in the 1/23/96 memo by S. Hummel (D216884).

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MANCOZEB
PC Code 014504; Case 0643
(D252614, D252618, D252679, D252689, D252691,
D252692, and D271640)

Registrant's Response to Residue Chemistry Data Requirements

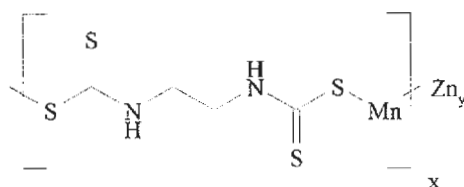
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MANCOZEB



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(DP Barcodes D252614, D252618, D252679, D252689, D252691, D252692 , and D271640)

REGISTRANT'S RESPONSE TO RESIDUE CHEMISTRY DATA REQUIREMENTS

PRESENT SUBMISSIONS

In support of reregistration, the Mancozeb Task Force (with members consisting of Elf Atochem North America, Inc., Griffin LLC, and Rohm and Haas Company) has submitted the results of several studies depicting the magnitude of mancozeb and ETU residues in/on banana (1998; MRID 44726001), cranberry (1998; MRID 44725701), grape (1999; MRID 44730801), dry bulb onion (1998; MRID 44725501), pear (1998; MRID 44725901), and sugar beet (1998; MRID 44725101). In addition, Rohm and Haas Company submitted cotton field trial data (1996; MRID 44038801) in support of existing Section 24(c) registrations. These submissions are evaluated herein for their adequacy in fulfilling residue chemistry data requirements for the reregistration of mancozeb.

BACKGROUND

Mancozeb is a FIFRA List A reregistration pesticide. A Registration Standard was issued 3/87, with the Residue Chemistry Chapter completed 9/10/86, and several updates issued subsequently. A Registration Standard Update was completed 8/11/92.

The Task Force previously submitted a protocol for the conduct of mancozeb residue field trials on many food/feed crops including bananas, cotton, cranberries, grapes, onions, pears, and sugar beets. The protocol included proposals with regard to fulfilling data requirements for each crop as stated in the 8/11/92 Mancozeb Update, the data requirements for each crop as stated in the 6/94 guidance on "Number and Location of Field Trials", the difference between the number and location of field trials as required in the 6/94 guidance, and their proposal for the number and location of trials which the Task Force will conduct. The Task Force provided justification for providing fewer than the number of trials required in the 6/94 guidance.

The protocol along with the rationale for reduction in the number of field trials was addressed by the Agency (DP Barcode D216884, S. Hummel, 1/23/96) following thorough consideration of existing mancozeb residue field trial data and then newly issued Agency guidance documents. Consequently, the reregistration requirements for many food/feed crops including bananas, cotton, cranberries, grapes, onions, pears, and sugar beets were modified. For the purpose of clarity and consistency, the reregistration requirements with regard to the number and location of field trials, as specified in the protocol review, are reiterated under the “OPPTS GLN 860.1500: Crop Field Trials” section of this document.

The Agency additionally concluded in the protocol review that storage stability data will not be needed for the crops addressed in the protocol other than onions and sugar beets, provided samples are analyzed for ETU within 2 weeks of harvest and for mancozeb within 30 days of harvest. The review also concluded that no additional storage stability studies will be required provided the laboratory analyzing the samples for each commodity has analyzed the same closely related commodity within the past five years with satisfactory storage stability. HED notes that the performing laboratory, Morse Laboratories, has performed residue analyses of mancozeb-treated RACs within the past five years.

The qualitative nature of the residue in plants and livestock is adequately understood. Mancozeb and ethylenethiourea (ETU) are the residues of concern. Tolerances for residues of mancozeb in/on raw agricultural and processed commodities are currently expressed in terms of the residues of a fungicide which is a coordination product of zinc ion and maneb (manganous ethylene bisdithiocarbamate) containing 20 percent manganese, 2.5 percent zinc, and 77.5 percent ethylene-bisdithiocarbamate (the whole product calculated as zinc ethylenebisdithiocarbamate) [40 CFR §180.176, §180.319, §185.6300, and §186.6300]. The Agency has recommended that the tolerance expression for mancozeb be revised to include residues of ETU.

Several methods are available for data collection and tolerance enforcement. In the absence of methods which are capable of differentiating between/among EBDC fungicides, the Keppel colorimetric method (designated as Method III in PAM Vol. II) is the preferred enforcement method. The Keppel method, which analyzes EBDCs as a group by degradation to carbon disulfide, is the official method for certain dithiocarbamates including mancozeb (JAOAC, 54(3):528-531). The preferred enforcement method for determination of ETU is the Onley method (AOAC 14th Edition 29.119:554).

Codex limits for EBDC fungicides are grouped under dithiocarbamates. Maximum residue limits (MRLs) for dithiocarbamates are established for several commodities resulting from the use of mancozeb, maneb, metiram, propineb, thiram, and ziram and are currently expressed as ppm carbon disulfide. Currently, no Codex MRLs are established or prior MRLs have been revoked for residues of ETU for any commodity. Harmonization of the U.S. tolerances with Codex MRLs is impractical at the present time.

CONCLUSIONS AND RECOMMENDATIONS

OPPTS GLN 860.1340: Residue Analytical Methods

1. Based on overall average recoveries, the analytical methods used to measure residues of mancozeb and ETU in/on RAC samples, collected from the submitted field trial and storage stability studies, are adequate for data collection. Mancozeb residues were determined using a GC method with flame photometric detection (Morse Laboratories SOP Meth-8, Revision #3 and SOP Meth-78; McKenzie Laboratories method PRM-005, Rev. 2). ETU residues were determined using an HPLC method with electrochemical detection (Morse Laboratories SOP Meth-17, Revision #2; McKenzie Laboratories method PRM-006, Rev. 1). The validated LOQs were 0.05 ppm (bananas, cranberries, grapes, pears, sugar beet roots and tops), 0.02 ppm (cottonseed), and 0.4 ppm (dry bulb onion) for mancozeb and 0.01 ppm (all matrices) for ETU.

OPPTS GLN 860.1380: Storage Stability Data

The adequacy or inadequacy of available storage stability data, in support of the submitted residue field studies, follows.

- 2a. Banana: Samples of harvested bananas were stored frozen for up to 38 days prior to residue analysis. The Task Force cited previously reviewed storage stability data for apples and grapes (DP Barcode D207579, 9/6/96, S. Hummel) because banana samples from the current submission were stored for intervals slightly longer than the limits allowed in the protocol review. In apples, residues of mancozeb and ETU are relatively stable after 7.0 and 3.5 months, respectively, of frozen storage; it was additionally reported that ETU residues in/on whole apples decline by ~27% after 7 months of storage. In grapes, residues of mancozeb and ETU are stable after 8 and 2 weeks, respectively, of frozen storage; ETU residues in/on grapes declined ~30% and ~45% after 4 and 9 weeks, respectively. HED concludes that the available storage stability data for apples and grapes may be translated to bananas, and that no additional storage stability data are required to support the banana field trials.
- 2b. Cottonseed: Samples of harvested cottonseed were stored frozen for up to 49 and 38 weeks prior to determination of mancozeb and ETU residues, respectively. Included in the cottonseed field trials were the results of a freezer storage stability study which indicates that mancozeb and ETU are relatively stable in/on cottonseed after 50 and 49 weeks, respectively, of storage. No additional storage stability data are required to validate the storage conditions and intervals of samples collected from the cotton field trials reviewed in this document only.
- 2c. Cranberry: Samples of harvested cranberries were stored frozen for up to 14 and 64 days prior to determination of mancozeb and ETU residues, respectively. Because cranberry

samples were stored for more than 14 days prior to ETU analysis, HED will allow translation of ETU storage stability data from grapes to cranberries. No additional storage stability data are required to support the cranberry field trials.

- 2d. Grape: Samples of harvested grapes were stored frozen for 12 and 15 days prior to mancozeb and ETU determination, respectively. These storage intervals are within the allowed interval limits specified in the protocol review. Therefore, no additional storage stability data are required to support the grape field trials.
- 2e. Onion, dry bulb: Samples of harvested dry bulb onions were stored frozen for up to 22 and 19 days prior to determination of mancozeb and ETU residues, respectively. No concurrent storage stability data were submitted to validate the storage intervals and conditions of samples collected from the onion field trials. Supporting storage stability data for dry bulb onions are required as requested in the protocol review. The Task Force has indicated that a new storage stability study for onions would be conducted.
- 2f. Pear: Samples of harvested pears were stored frozen for up to 18 days prior to residue analysis. Because pear samples were stored for an interval slightly longer than the limits allowed in the protocol review, HED will allow translation of storage stability data from apples to pears. No additional storage stability data are required to support the pear field trials.
- 2g. Sugar beet: Samples of harvested sugar beet roots were stored frozen for up to 45 and 56 days prior to mancozeb and ETU determination, respectively. Sugar beet tops were stored frozen for up to 44 and 61 days prior to mancozeb and ETU determination, respectively. Included in the sugar beet field trials were the results of a freezer storage stability study. In sugar beet roots, the study suggests that residues of mancozeb and ETU are relatively stable after 46 days and 68 days, respectively, of storage. In sugar beet tops, residues of mancozeb and ETU are also stable after 46 and 14 days, respectively, of storage. It was additionally reported that ETU residues in/on sugar beet tops declined by ~50% and ~35% after 5 and 10 weeks, respectively, of frozen storage. During tolerance reassessment, HED will take into consideration the observed decline in ETU residues resulting from freezer storage of sugar beet tops.

OPPTS GLN 860.1500: Crop Field Trials

Banana

- 3a. The submitted residue data for bananas are acceptable. The combined residues of mancozeb and ETU did not exceed the established tolerance of 4.0 ppm in/on whole bananas harvested immediately (0-day PHI) following the last of ten foliar broadcast applications, with 7-21 day retreatment intervals, of the 75% DF formulation at 2.4 lb ai/A/application (24.0 lb ai/A/season; 1x). The combined residues of mancozeb and ETU

in/on six samples each of treated bagged and unbagged whole bananas were <0.06-<0.141 ppm and <0.241-<1.190 ppm, respectively.

- 3b. Residue data reviewed in the Mancozeb Update indicate that the combined residues of mancozeb and ETU in/on whole banana fruit harvested 0 days following a treatment schedule reflecting the maximum use pattern were <0.26-<1.01 ppm. Based on the aggregate of data reflecting ~1x, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on banana whole fruit be reassessed from 4.0 to 2.0 ppm. We reiterate the previous Agency recommendation to revise the mancozeb tolerance on bananas to delete the reference to pulp.
- 3c. HED concurs with the registrant's comments that the results of the residue decline study for bananas are inconclusive. Residues were relatively consistent at all four storage intervals (3, 7, 14, and 28 days of storage at 12.8 C before being frozen), suggesting that commercial banana storage and transport would have little impact on mancozeb and ETU breakdown.

Cotton

- 4a. The submitted residue data for cottonseed are adequate to support current Section 24(c) registrations. The combined residues of mancozeb and ETU did not exceed the established tolerance of 0.5 ppm in/on cottonseed harvested 128-161 days following a single in-furrow application of the 75% DF formulation made at planting at 2.27-3.27 lb ai/A (~1x the maximum registered seasonal rate for in-furrow application). Residues of mancozeb and ETU in/on all samples of treated ginned cottonseed were each nondetectable (<0.02 ppm for mancozeb and <0.01 ppm for ETU). These data will support mancozeb uses registered under FIFRA Section 24(c) for MS930002 and will also be extended to support AR930005, AR930006, and LA940001. Residue data for cotton gin byproducts, resulting from in-furrow application, were not included in the current submission; these data remain outstanding.
- 4b. To support current Section 3 registrations of mancozeb on cotton, reregistration residue data requirements for undelinted cottonseed and cotton gin byproducts remain outstanding as specified in the Agency 1/23/96 protocol review.

Cranberry

- 5a. The submitted residue data for cranberry are acceptable. The combined residues of mancozeb and ETU did not exceed the established tolerance of 7.0 ppm in/on cranberries harvested 30 days following the last of three foliar broadcast applications, with 7-8 day retreatment intervals, of the 75% DF formulation at 4.85-4.90 lb ai/A/application (14.4 lb ai/A/season; ~1x). The combined residues of mancozeb and ETU in/on a single sample of treated cranberries were 6.22-6.75 ppm.

- 5b. Residue data reviewed in the Mancozeb Update indicate that the combined residues of mancozeb and ETU in/on cranberries, harvested 30 days following the last of four foliar broadcast applications of the 80% WP formulation at 4.8 lb ai/A/application (1x) were 4.76 and 4.96 ppm. Residue data reviewed in the Residue Chemistry Science Chapter of the Guidance Document approximating the PD 4 use pattern indicate that the combined residues of mancozeb and ETU will not exceed the established 7 ppm tolerance for cranberries. Based on the aggregate of data reflecting ~1x, HED concludes that the established mancozeb tolerance for cranberries is appropriate.

Grape

- 6a. The submitted residue data for grape are acceptable. The combined residues of mancozeb and ETU did not exceed the established tolerance of 7.0 ppm in/on grapes harvested 66 days following the last of either (i) six foliar broadcast applications, with 6- to 7-day retreatment intervals, of the 75% DF formulation at 3.1-3.4 lb ai/A/application (19.48 lb ai/A/season; ~1x the maximum seasonal rate for states east of the Rocky Mountains), or (ii) three foliar broadcast applications, with 7- to 8-day retreatment intervals, of the 75% DF formulation at 2.0 lb ai/A/application (6.08 lb ai/A/season; ~1x the maximum seasonal rate for states west of the Rocky Mountains). The combined residues of mancozeb and ETU in/on duplicate samples of treated grapes were <0.125-<0.792 ppm.
- 6b. Data reviewed in the Mancozeb Update indicate that residues in/on grapes, harvested 66 days following the last of four foliar broadcast applications of the 80% WP formulation at 3.2 lb ai/A/application (~2x maximum seasonal rate for states west of the Rocky Mountains) were 0.38-1.65 ppm for mancozeb and <0.01-0.03 ppm for ETU. Residues in/on grapes, harvested 66 days following the last of 4 or 5 applications of the 80% WP formulation at 3.2 lb ai/A/application (~0.7-0.8x maximum seasonal rate for states east of the Rocky Mountains) were 0.41-1.83 ppm for mancozeb and <0.01-0.04 ppm for ETU. Based on the aggregate of data reflecting ~1x, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on grapes be reassessed from 7.0 to 2.0 ppm.

Onion, dry bulb

- 7a. Pending receipt of acceptable storage stability data (see Conclusion 2e), the submitted residue data for dry bulb onions are acceptable. The combined residues of mancozeb and ETU were above the established tolerance of 0.5 ppm in/on dry bulb onions harvested 7 days following the last of 10 foliar broadcast applications, with 6- to 8-day retreatment intervals, of the 75% DF formulation at 2.3-2.8 lb ai/A/application (24.14-24.34 lb ai/A/season; ~1x). The combined residues of mancozeb and ETU in/on samples of treated onions were <0.41-<1.80 ppm.
- 7b. Residue data reviewed in the Mancozeb Update indicate that residues in/on onions, harvested 7 days following the last of 10 foliar broadcast applications of the 80% WP formulation at 2.4 lb ai/A/application (1x maximum seasonal rate) were 0.051-0.068 ppm

for mancozeb and 0.013-0.017 ppm for ETU. The available onion data suggest that a higher mancozeb tolerance may be needed to support the use pattern eligible for reregistration. The Agency will reassess the mancozeb tolerance on dry bulb onions when the requested supporting storage stability data have been submitted and evaluated.

Pear

- 8a. The submitted residue data for pears are acceptable. The combined residues of mancozeb and ETU did not exceed the established tolerance of 10 ppm in/on mature pears following multiple applications of the 75% DF formulation according to these three treatment schedules: (i) schedule 1 - four prebloom/bloom/post bloom applications at 4.7-5.1 lb ai/A/application (18.97-19.69 lb ai/A/season; ~1x the maximum seasonal rate for prebloom applications) and PHIs of 108-129 days ; (ii) schedule 2 - seven foliar applications at 2.3-2.5 lb ai/A/application (16.74-16.95 lb ai/A/season; ~1x the maximum seasonal rate for extended foliar applications) and a 77-day PHI; and (iii) schedule 3 - five prebloom/bloom applications at 6.2-6.7 lb ai/A/application (31.88-32.57 lb ai/A/season) and a 77-day PHI. The ranges of combined residues of mancozeb and ETU in/on treated samples were <0.07- <0.14, <0.11-<0.66, and <0.34-<1.01 ppm from schedules 1, 2, and 3 respectively.
- 8b. Residue data reviewed in the Mancozeb Update were conducted at exaggerated rates and do not reflect the use pattern being supported for reregistration. Based on residue data from the current submission, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on pears be reassessed from 10.0 to 1.0 ppm.

Sugar Beet

- 9a. The submitted residue data for sugar beet roots and tops are acceptable. The combined residues of mancozeb and ETU did not exceed established tolerances of 2.0 and 65.0 ppm in/on samples of sugar beet root and tops, respectively, that were harvested 14 days following the last of seven foliar broadcast applications, with 7- to 11-day retreatment intervals, of the 75% DF formulation at 1.56-1.75 lb ai/A/application (11.06-11.33 lb ai/A/season; ~1x). The combined residues of mancozeb and ETU in/on samples of treated sugar beet roots and tops were <0.03-<0.65 ppm and 3.66-31.57 ppm, respectively.
- 9b. Additional data for sugar beet root, reviewed in the Residue Chemistry Chapter of the Mancozeb Registration Standard dated 9/10/86, indicate that residues were <0.05-1.5 ppm for mancozeb and <0.01-0.029 ppm for ETU at PHIs of 6-28 days following the last of 5-8 foliar broadcast applications of the 80% WP formulation at 1.6 lb ai/A/application (~1x maximum seasonal rate). Based on the aggregate of data reflecting ~1x, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on sugar beet roots be reassessed at its existing level of 2.0 ppm.
- 9c. Two additional studies for sugar beet tops were reviewed in the Residue Chemistry Chapter of the Mancozeb Registration Standard dated 9/10/86. In one study, residues were 95.0-99.5 ppm for mancozeb and <0.01-1.26 ppm for ETU in/on samples harvested 15

days following the last of four foliar broadcast applications of the 80% WP formulation at 1.6 lb ai/A/application (1x maximum single application rate, 0.6x the maximum seasonal application rate allowed by PD 4). In another study, residues were 2.8-20.0 ppm for mancozeb and <0.01-0.042 ppm for ETU in/on samples harvested 7-28 days following the last of 6-7 foliar broadcast applications of the 80% WP formulation at 1.6 lb ai/A/application (~1x maximum seasonal rate allowed by the PD 4). Based on the aggregate of data reflecting ~1x, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on sugar beet tops be reassessed from 65 ppm to 100 ppm.

DETAILED CONSIDERATIONS

OPPTS GLN 860.1340: Residue Analytical Methods

Samples of whole bananas, cottonseed, cranberries, grapes, onions (bulb), pears, and sugar beets from the submitted field trial and storage stability studies were analyzed for residues of mancozeb and ETU by Morse Laboratories, Inc. (Sacramento, CA) and McKenzie Laboratories (Phoenix, AZ). Mancozeb residues were determined using a GC method with flame photometric detection (Morse Laboratories SOP Meth-8, Revision #3 and SOP Meth-78; McKenzie Laboratories method PRM-005, Rev. 2), and ETU residues were determined using an HPLC method with electrochemical detection (Morse Laboratories SOP Meth-17, Revision #2; McKenzie Laboratories method PRM-006, Rev. 1). The LOQs were 0.05 ppm (bananas, cranberries, grapes, pears, sugar beet roots and tops), 0.02 ppm (cottonseed), and 0.4 ppm (dry bulb onion) for mancozeb and 0.01 ppm (all matrices) for ETU. Raw data, sample calculations, and representative chromatograms were submitted. Brief discussions of the methods follow.

Mancozeb method: The method involved the conversion of EBDC residues to carbon disulfide (CS₂) which was quantitated by GC/FPD. Briefly, residues were extracted with 10% EDTA, 8 N HCl, and 3% stannous chloride solution. The mixture was reacted for 2 hours in a boiling water bath and then maintained at 100 C for analysis. An aliquot of the headspace was analyzed by GC/FPD for CS₂.

ETU method: Briefly, samples were combined with water, and the pH was adjusted to 11-12 with ammonium hydroxide. Sodium chloride, Celite, and ethanol were added, and the mixture was filtered through Celite. Water was added, and the pH was adjusted (if necessary) to 7-9. The extract was concentrated by rotary evaporation and applied to an alumina column; residues were eluted with ethanol:chloroform (6:94, v:v). The eluate was concentrated and redissolved in water for quantitation by HPLC using a Zorbax RX-C8 column, an isocratic mobile phase of 0.5% methanol in 0.02 M phosphoric acid, and electrochemical detection.

The laboratories validated the methods prior to analysis of the field trial samples. Untreated samples of bananas, cottonseed, cranberries, onions, pears, and sugar beet (roots and tops) were

each fortified with mancozeb and ETU. In addition, concurrent method recovery data were provided using untreated samples of bananas, cottonseed, cranberries, grapes, onions, pears, and sugar beet (roots and tops) collected from the field trials. The results of the method validation and concurrent method recovery analyses are presented in Table 1. HED concludes that the analytical methods used to measure residues of mancozeb and ETU are adequate for data collection based on overall average recoveries.

Table 1. Recoveries of mancozeb and ETU from various RACs following analyses by GC/FPD and HPLC/ECD, respectively.

Matrix	Mancozeb			ETU		
	Fortification Levels (ppm)	% Recovery ^a	Mean \pm s.d. ^b	Fortification Levels (ppm)	% Recovery ^a	Mean \pm s.d. ^b
Method validation recoveries						
Banana, whole	0.05	107	--	0.01	73	--
Cottonseed, ginned	0.02-2.0	72-100 (6)	[85 \pm 11]	0.01-0.1	99-108 (6)	[104 \pm 3]
Cranberry	0.05	93	--	0.01	87	--
Onions	0.4, 8.0	83, 90	[87]	0.01, 0.25	92, 98	[95]
Pear ^c	0.05-2.0	71-86 (6)	[78 \pm 6]	0.01-0.5	87-92 (6)	[89 \pm 2]
Pear ^d	0.05, 2.0	73, 74	[74]	0.01, 0.25	82, 90	[86]
Sugar beet, root	0.02, 1.0	80, 95	[88]	0.01, 0.25	70, 82	76
Sugar beet, top	0.02, 1.0	70, 75	[73]	0.01, 0.25	67, 80	[74]
Concurrent method recoveries						
Banana, whole	0.05, 2.0	82-114 (11); 132	[98 \pm 14]	0.01-0.25	50-66 (8); 72-87 (5)	[55 \pm 26]
Cottonseed, ginned	0.02-2.0	73-84 (6)	[78 \pm 4]	0.01, 0.1	78-108 (6)	[89 \pm 13]
Cranberry	0.05, 2.0	73, 111	[92]	0.01, 0.25	68; 71	[70]
Grape	0.05, 2.0	82-113 (4)	[98 \pm 14]	0.01, 0.25	64; 72-74 (3)	[71 \pm 4.6]
Onions	0.4, 8.0	70-106 (4)	[85 \pm 15]	0.01, 0.25	89-106 (7)	[95 \pm 6]
Pear ^e	0.05-2.0	70-73 (4)	[72 \pm 1.5]	0.01-0.5	79-97 (4)	[85 \pm 8.3]
Pear ^f	0.05, 2.0	77-103 (8)	[84 \pm 8.8]	0.01, 0.25	79-99 (6)	[90 \pm 6.6]
Sugar beet, root	0.02, 1.0	78-112 (8)	[94 \pm 11]	0.01-0.25	58-68 (4); 71-95 (8)	[76 \pm 12]
Sugar beet, top	0.02-35	77-106 (8)	[90 \pm 10]	0.01-0.25	63-69 (4); 70-90 (8)	[75 \pm 9]

^a Recovery values outside the acceptable range of 70-120% are listed separately; each value represents one sample unless otherwise indicated in parentheses.

^b Overall average recovery \pm standard deviation in brackets.

^c Pear samples purchased from a grocery store and analyzed at McKenzie Laboratories.

^d Pear samples purchased from a grocery store and analyzed at Morse Laboratories.

^e Pear samples from the CA test sites were analyzed at McKenzie Laboratories. Because of subsequent problems with the method and ETU analyses, no other samples were analyzed there.

^f Pear samples from the ID, OR, and WA test sites were analyzed at Morse Laboratories.

OPPTS GLN 860.1380: Storage Stability Data

Sample storage intervals and conditions

The Task Force provided adequate information pertaining to storage-handling procedures of

samples collected from the subject crop field trials. In general, the Task Force maintained sample integrity by freezing the samples immediately or within hours of harvest and transporting the frozen samples to the respective analytical laboratories in an ACDS freezer truck. Upon arrival at the analytical labs, samples were stored frozen (-20 ± 5 C) prior to residue analysis. The total storage intervals (between harvest and residue analysis) of collected samples are presented below in Table 2.

Table 2. Storage intervals of frozen commodities collected from various field trials.

Commodity	MRID	Storage Interval	
		Mancozeb	ETU
Banana, whole	44726001	15-38 days	10-38 days
Cottonseed, ginned	44038801	34.9-48.9 weeks	31.4-38.1 weeks
Cranberry	44725701	14 days	64 days
Grape	44730801	11-12 days	11-15 days
Onion, dry bulb	44725501	9-22 days	9-19 days
Pear (analyzed by McKenzie Lab)	44725901	9 days	11 days
Pear (analyzed by Morse Lab)		11-18 days	13-18 days
Sugar beet, root	44725101	22-45 days	30-56 days
Sugar beet, top		16-44 days	47-61 days

Storage stability data

Included in the residue field trials for cottonseed, grapes, and sugar beets are the results of fortification studies, conducted to validate the storage intervals and conditions of samples. Untreated RAC samples were separately fortified with mancozeb and ETU. Following fortification, samples were stored frozen (temperature unspecified). Subsamples were taken at various storage intervals and analyzed for residues of mancozeb and ETU. The results of the storage stability study are presented in Table 3.

Table 3. Freezer storage stability and concurrent method recoveries of mancozeb and ETU from cottonseed, grapes, and sugar beet roots and tops fortified separately with mancozeb and ETU.

Matrix (MRID)	Fortification level, ppm	Storage Interval, weeks	Fresh Fortification Recovery, % ^a	Storage Stability Recovery, %	Corrected Storage Stability Recovery, % ^b
Mancozeb					
Cottonseed, ginned (44038801)	2.5	0	79, 79, 81, 83 (81)	--	--
		2	78, 78 (78)	78, 81	100, 104
		50	70, 76 (73)	65, 76	89, 104

Table 3 (continued).

Matrix (MRID)	Fortification level, ppm	Storage Interval, weeks	Fresh Fortification Recovery, % ^a	Storage Stability Recovery, %	Corrected Storage Stability Recovery, % ^b
Grape (44730801)	1.0	0	86, 88, 90, 91 (89)	--	--
		2	87, 90 (89)	78, 80	88, 90
		4	84, 88 (86)	81, 85	94, 99
		8	83, 86 (85)	86, 87	101, 102
Sugar beet, root (44725101)	1.0	0	83, 85, 86, 88 (86)	--	--
		2	87, 87 (87)	85, 87	98, 100
		4	80, 82 (81)	81, 83	100, 102
		46-day	77, 81 (79)	84, 84	106, 106
Sugar beet, top (44725101)	1.0	0	82, 85, 88, 89 (86)	--	--
		2	84, 95 (90)	77, 86	86, 96
		4	78, 81 (80)	74, 74	93, 93
		46-day	77, 87 (82)	76, 79	93, 96
ETU					
Cottonseed, ginned (44038801)	0.5	0	83, 86, 90, 96 (89)	--	--
		2	86, 88 (87)	80, 82	92, 94
		49	88, 92 (90)	69, 72	77, 80
Grape (44730801)	0.5	0	95, 97, 102, 102 (99)	--	--
		2	89, 89 (89)	74, 77	83, 87
		4	90, 91 (91)	58, 67	64, 74
		9	79, 80 (80)	41, 45	51, 56
Sugar beet, root (44725101)	0.5	0	81, 81, 82, 86 (83)	--	--
		2	87, 92 (90)	78, 82	87, 91
		5	82, 83 (83)	78, 80	94, 96
		68-day	97, 99 (98)	79, 85	81, 87
Sugar beet, top (44725101)	0.5	0	67, 74, 77, 78 (74)	--	--
		2	79, 80 (80)	54, 61	68, 76
		5	73, 74 (74)	36, 44	49, 59
		66-day	75, 87 (81)	51, 55	63, 68

^a Average fresh fortification recovery values are noted in parentheses.^b Calculated by dividing the storage stability recovery by the mean fresh fortification recovery.

Conclusions

The adequacy or inadequacy of available storage stability data, in support of the submitted residue field studies, follows.

Banana: Samples of harvested bananas were stored frozen for up to 38 days prior to residue analysis. The Task Force cited previously reviewed storage stability data for apples and grapes (DP Barcode D207579, 9/6/96, S. Hummel) because samples were stored for intervals slightly longer than the limits allowed in the protocol review. In apples, residues of mancozeb and ETU are relatively stable after 7.0 and 3.5 months, respectively, of frozen storage; it was additionally reported that ETU residues in/on whole apples decline by ~27% after 7 months of storage. In grapes, residues of mancozeb and ETU are stable after 8 and 2 weeks, respectively, of frozen storage; ETU residues in/on grapes declined ~30% and ~45% after 4 and 9 weeks, respectively. HED concludes that the available storage stability data for apples and grapes may be translated to bananas, and that no additional storage stability data are required to support the banana field trials.

Cottonseed: Samples of harvested cottonseed were stored frozen for up to 49 and 38 weeks prior to determination of mancozeb and ETU residues, respectively. Included in the cottonseed field trials were the results of a freezer storage stability study which indicates that mancozeb and ETU are relatively stable in/on cottonseed after 50 and 49 weeks, respectively, of storage. No additional storage stability data are required to validate the storage conditions and intervals of samples collected from the cotton field trials reviewed in this document only.

Cranberry: Samples of harvested cranberries were stored frozen for up to 14 and 64 days prior to determination of mancozeb and ETU residues, respectively. Because cranberry samples were stored for more than 14 days prior to ETU analysis, HED will allow translation of ETU storage stability data from grapes to cranberries. No additional storage stability data are required to support the cranberry field trials.

Grape: Samples of harvested grapes were stored frozen for 12 and 15 days prior to mancozeb and ETU determination, respectively. These storage intervals are within the allowed interval limits specified in the protocol review. Therefore, no additional storage stability data are required to support the grape field trials.

Onion, dry bulb: Samples of harvested dry bulb onions were stored frozen for up to 22 and 19 days prior to determination of mancozeb and ETU residues, respectively. It is noted that no concurrent storage stability data were submitted to validate the storage intervals and conditions of samples collected from the onion field trials. Supporting storage stability data for dry bulb onions are required as requested in the protocol review. The Task Force has indicated that a new storage stability study for onions would be conducted.

Pear: Samples of harvested pears were stored frozen for up to 18 days prior to residue analysis. Because pear samples were stored for an interval slightly longer than the limits allowed in the protocol review, HED will allow translation of storage stability data from apples to pears. No additional storage stability data are required to support the pear field trials.

Sugar beet: Samples of harvested sugar beet roots were stored frozen for up to 45 and 56 days prior to mancozeb and ETU determination, respectively. Sugar beet tops were stored frozen for up to 44 and 61 days prior to mancozeb and ETU determination, respectively. Included in the sugar beet field trials were the results of a freezer storage stability study. In sugar beet roots, the study suggests that residues of mancozeb and ETU are relatively stable after 46 days and 68 days, respectively, of storage. In sugar beet tops, residues of mancozeb and ETU are stable after 46 and 14 days, respectively, of storage. It was additionally reported that ETU residues in/on sugar beet tops declined by ~50% and ~35% after 5 and 10 weeks, respectively, of frozen storage. During tolerance reassessment, HED will take into consideration the observed decline in ETU residues resulting from freezer storage of sugar beet tops.

OPPTS GLN 860.1500: Crop Field Trials

Banana

Established tolerance: A tolerance of 4.0 ppm has been established for residues of the fungicide mancozeb, a coordination product of zinc ion and maneb (manganous ethylene bisdithiocarbamate) containing 20 percent manganese, 2.5 percent zinc, and 77.5 percent ethylene-bisdithiocarbamate (the whole product calculated as zinc ethylenebisdithiocarbamate) in/on bananas, preharvest use only, of which not more than 0.5 ppm shall be in the pulp after peel is removed and discarded [40 CFR §180.176].

Use patterns registered to members of the Mancozeb Task Force: There are several mancozeb end-use products (EPs) registered to the Mancozeb Task Force which are permitted for use on bananas; these products are listed in Table 4.

Table 4. Mancozeb EPs registered to the Mancozeb Task Force which are permitted for use on bananas.

EPA Reg. No.	Formulation	Label Acceptance Date	Product Name
Rohm and Haas Company			
707-78	80% WP	9/30/98	Dithane M-45® Agricultural Fungicide
707-156	4 lb/gal FIC	12/9/99	Dithane F-45® Flowable Mancozeb Agricultural Fungicide
707-162	3.48 lb/gal FIC	10/11/94	Dithane M-45® Flowable M Agricultural Fungicide
707-179	70% DF	10/11/94	Dithane® DF/70 Agricultural Fungicide
707-180	75% DF	8/15/97	Dithane DF® Agricultural Fungicide
707-241	80% WP	8/15/97	Dithane® WSP Agricultural Fungicide
Griffin Corporation (mancozeb products transferred from E. I. du Pont de Nemours and Co.)			
1812-360	15% DF	12/19/97	ManKocide® Fungicide/Bactericide
1812-414 (transferred from 352-449)	75% DF	10/9/98	Manzate® 200 DF Fungicide
1812-415 (transferred from 352-341)	80% WP	10/28/99	Manzate® 200 Fungicide
1812-416 (transferred from 352-398)	4 lb/gal FIC	10/9/98	Manzate® 200 Flowable Fungicide
Elf Atochem North America, Inc.			
4581-358	80% WP	8/31/99	Penncozeb® 80WP Fungicide
4581-370	75% DF	8/31/99	Penncozeb® 75DF 75% Dry Flowable Fungicide

The 80% WP, the 15%, 70% and 75% DF, and the 3.48 and 4 lb/gal FIC formulations are registered for a maximum single application rate of 2.4 lb ai/A, a maximum of 10 applications or 24 lb ai/A/season, with retreatment intervals of 14-21 days using ground or aerial equipment. Applications are to be made in a minimum of 2-3 gal/A of water when using aerial equipment; aerial applications in CA are to be made in a minimum of 5 gal/A (Rohm and Haas products only). Applications are to be made in a minimum of 20 gal/A of water when using ground equipment (Griffin products only). For all other products, a minimum application volume for ground equipment is not specified. A 0-day PHI has been established. HED notes that the mancozeb uses on banana, as registered to the members of the Mancozeb Task Force, reflect the maximum use pattern cited in the EBDC PD 4 as well as the HED protocol review.

Reregistration requirements as per 1/23/96 protocol review: Three additional field trials are needed for bananas, one in FL and two in HI. Alternatively, if the Task Force does not wish to conduct field trials in the U.S., they may conduct eight foreign field trials in major banana growing countries (2/3 in Central America and 1/3 in South America). Banana samples must be frozen whole at the time of collection. Analysis of whole bananas only is required. The mancozeb tolerance on bananas will be changed to delete the reference to pulp.

Discussion of data (1998; MRID 44726001): Three banana field trials were conducted during the 1996 growing season in FL (Region 3; 1 trial) and HI (Region 13; 2 trials). Banana plants were treated with ten foliar broadcast applications, with 7- to 21-day retreatment intervals, of the 75% DF formulation (EPA Reg. No. 707-180) at 2.4 lb ai/A/application (24.0 lb ai/A/season; 1x the maximum registered seasonal rate) using ground equipment. Applications were made in 300 gal/A of water (FL test site) and 18.6-19.4 gal/A of water (HI test sites). Bananas were harvested immediately (0-day PHI) following the final application. Additional fruit samples, collected from FL, were placed in refrigerated storage (12.8 C) for 0, 3, 7, 14, and 28 days prior to being frozen and shipped to the analytical laboratory to demonstrate residue decline.

One control and duplicate treated samples of bagged and unbagged bananas were collected from each test plot. Information pertaining to handling and storage procedures of harvested samples is found in "Storage Stability Data" section of this document. The harvested samples were analyzed for residues of mancozeb and ETU using the methods described in "Residue Analytical Methods" section. Apparent residues of mancozeb were less than the LOQ (<0.05 ppm) in/on three samples of untreated unbagged bananas and two samples of untreated bagged bananas. Apparent residues of ETU were less than the LOQ (<0.01 ppm) in/on three untreated samples each of bagged and unbagged bananas. One sample of untreated bagged bananas bore detectable mancozeb residues of 0.238 ppm which the registrant attributed to sampling contamination. The results of the banana field study are presented in Table 5.

Table 5. Residues of mancozeb and ETU in/on bananas harvested 0 days following the last of 10 foliar applications of the 75% DF formulation at 2.4 lb ai/A/application (~1x the maximum seasonal rate).

Banana Commodity	Test State	DAS ^a	Residues (ppm) ^b		
			Mancozeb	ETU	Combined
Bagged fruit	FL	0	0.067, 0.131	<0.01, <0.01	<0.077, <0.141
	HI	0	<0.05, <0.05	<0.01, <0.01	<0.06, <0.06
	HI	0	<0.05, <0.05	<0.01, <0.01	<0.06, <0.06
Unbagged fruit	FL	0	0.589, 0.800	<0.01, <0.01	<0.599, <0.810
		3	0.433, 1.330	<0.01, <0.01	<0.443, <1.340
		7	0.739, 1.430	<0.01, <0.01	<0.749, <1.44
		14	0.223, 1.360	<0.01, <0.01	<0.233, <1.37
		28	0.606, 0.850	<0.01, <0.01	<0.616, <0.860
	HI	0	0.231, 0.287	<0.01, <0.01	<0.241, <0.297
	HI	0	0.379, 1.180	<0.01, <0.01	<0.389, <1.190

^a DAS = Days after 12.8 C storage began until being placed in freezer.

^b Residues were not corrected for concurrent method recovery.

Geographic representation of data: Geographic representation of data is adequate. The protocol review specified that three banana trials be conducted in Regions 3 (1 trial) and 13 (2 trials). In the current submission, three banana trials were conducted in Regions 3 (FL; 1 trial) and 13 (HI; 2 trials).

Study summary: The submitted residue data for bananas are acceptable. The combined residues of mancozeb and ETU did not exceed the established tolerance of 4.0 ppm in/on whole bananas harvested immediately (0-day PHI) following the last of ten foliar broadcast applications, with 7-21 day retreatment intervals, of the 75% DF formulation at 2.4 lb ai/A/application (24.0 lb ai/A/season; 1x). The combined residues of mancozeb and ETU in/on six samples each of treated bagged and unbagged whole bananas were <0.06-<0.141 ppm and <0.241-<1.190 ppm, respectively.

Residue data reviewed in the Mancozeb Update indicate that the combined residues of mancozeb and ETU in/on whole banana fruit harvested 0 days following a treatment schedule reflecting the maximum use pattern were <0.26-<1.01 ppm. Based on the aggregate of data reflecting ~1x, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on banana whole fruit be reassessed from 4.0 to 2.0 ppm. We reiterate the previous Agency recommendation to revise the mancozeb tolerance on bananas to delete the reference to pulp.

HED concurs with the registrant's comments that the results of the residue decline study for bananas are inconclusive. Residues were relatively consistent at all four storage intervals (3, 7, 14, and 28 days of storage at 12.8 C before being frozen), suggesting that commercial banana storage and transport would have little impact on mancozeb and ETU breakdown.

Cotton

Established tolerance: A tolerance of 0.5 ppm has been established for residues of the fungicide mancozeb, a coordination product of zinc ion and maneb (manganous ethylene bisdithiocarbamate) containing 20 percent manganese, 2.5 percent zinc, and 77.5 percent ethylene-bisdithiocarbamate (the whole product calculated as zinc ethylenebisdithiocarbamate) in/on cottonseed [40 CFR §180.176].

Use patterns registered to members of the Mancozeb Task Force: There are several mancozeb end-use products registered to the Mancozeb Task Force which are permitted for use on cotton; these products are listed in Table 6.

Table 6. Mancozeb EPs registered to the Mancozeb Task Force which are permitted for use on cotton.

EPA Reg. No.	Formulation	Label Acceptance Date	Product Name
Rohm and Haas Company			
707-78	80% WP	9/30/98	Dithane M-45® Agricultural Fungicide
707-156 ^a	4 lb/gal FIC	12/9/99	Dithane F-45® Flowable Mancozeb Agricultural Fungicide
707-162	3.48 lb/gal FIC	10/11/94	Dithane M-45® Flowable M Agricultural Fungicide
707-179	70% DF	10/11/94	Dithane® DF/70 Agricultural Fungicide
707-180 ^b	75% DF	8/15/97	Dithane DF® Agricultural Fungicide
707-241	80% WP	8/15/97	Dithane® WSP Agricultural Fungicide
Griffin Corporation (mancozeb products transferred from E. I. du Pont de Nemours and Co.)			
1812-414 (transferred from 352-449)	75% DF	10/9/98	Manzate® 200 DF Fungicide
1812-415 (transferred from 352-341)	80% WP	10/28/99	Manzate® 200 Fungicide
1812-416 (transferred from 352-398)	4 lb/gal FIC	10/9/98	Manzate® 200 Flowable Fungicide
Elf Atochem North America, Inc.			
4581-358	80% WP	8/31/99	Penncozeb® 80WP Fungicide
4581-370 ^c	75% DF	8/31/99	Penncozeb® 75DF 75% Dry Flowable Fungicide

^a Including SLN Nos. AR930005 and MS930002.

^b Including SLN Nos. AR930006 and MS930002.

^c Including SLN No. LA940001.

The 80% WP, the 70% and 75% DF, and the 3.48 and 4 lb/gal FIC formulations are registered for a maximum single application rate of 1.6 lb ai/A, a maximum of 4 foliar applications or 6.4 lb ai/A/season, with retreatment intervals of 10-14 days using ground or aerial equipment. Applications are to be made in a minimum of 2 gal/A of water when using aerial equipment; aerial applications in CA are to be made in a minimum of 5 gal/A (Rohm and Haas products only). Applications are to be made in a minimum of 20 gal/A of water when using ground equipment (Griffin products only). For all other products, a minimum application volume for ground equipment is not specified. A 45-day PHI has been established for Rohm and Haas and Griffin Products. A 60-day PHI has been established for Elf Atochem products. HED notes that mancozeb uses on cotton, as registered to the members of the Mancozeb Task Force, reflect the maximum use pattern cited in the EBDC PD 4 as well as the HED protocol review.

In addition, the 4 lb/gal FIC and 75% DF formulations include Section 24(c) registrations for the use of mancozeb as a single in-furrow spray application made at planting using ground equipment at 2.3-2.4 lb ai/A to control early season soilborne seeding disease in cotton. This use

is limited to AR, LA, and MS. The Agency (DP Barcode D192870, 7/22/93, D. Davis) previously concluded that residue data reflecting this use (in-furrow application to cotton) along with concurrent storage stability data and a processing study are required to support this Section 24(c) registration.

Reregistration requirements as per 1/23/96 protocol review: The protocol review only addressed the Section 3 reregistration requirements for cotton RACs. For cottonseed, four additional field trials are required in Region 8; alternatively, use may be limited to AZ/CA and no additional field trials for cottonseed are needed. For cotton gin byproducts, at least three field trials (one on stripper and two on picker cotton) are required from Regions 10 and 8.

Discussion of data (1996; MRID 44038801): This submission was made to support current Section 24(c) registrations of mancozeb on cotton. Ten field trials were conducted during the 1993 growing season in AL, AR, AZ, CA, GA, LA, MS, MO, TN, and TX. A single in-furrow application of the 75% DF (EPA Reg. No. 707-180) formulation was made at planting at 2.27-3.27 lb ai/A (~1x the maximum registered rate for in-furrow application). At two test sites (CA and LA), an additional plot received a single in-furrow application at planting of the 75% DF formulation at 12.83-16.35 lb ai/A (~5-7x the maximum registered seasonal rate for in-furrow application). Applications were made using ground equipment in 5.1-22 gal/A of water. A single untreated and treated sample of cotton forage were harvested by hand 44-59 days following application from each test site. A single untreated and treated sample of mature cotton were harvested by hand or mechanically (picker) 128-161 days following application from each test site.

The collected cotton forage samples were frozen within 2.5 hours of harvest. The collected samples of mature cotton were ginned within 24 hours and ginned cottonseed samples were frozen within ~2 hours after ginning. Some samples were first shipped by ACDS freezer truck to McKenzie Laboratories (Phoenix, AZ). However, following a protocol amendment, the samples were subsequently shipped by ACDS freezer truck to Morse Laboratories (Sacramento, CA) for analysis. Samples not initially shipped to McKenzie Laboratories were shipped directly to Morse Laboratories for analysis. Samples of cotton forage were not analyzed because cotton forage is no longer a required RAC commodity according to Table 1 (OPPTS GLN 860.1000). Total storage intervals from harvest to analysis for ginned cottonseed were 34.9-48.9 weeks (~5 months) for mancozeb and 31.4-38.1 weeks (~5 months) for ETU.

The harvested cottonseed samples were analyzed for residues of mancozeb and ETU using the methods described in "Residue Analytical Methods" section. Residues of mancozeb were less than the LOQ (<0.02 ppm) in/on all samples of untreated ginned cottonseed (n=19) and treated ginned cottonseed (n=10). Residues of ETU were less than the LOQ (<0.01 ppm) in/on all samples of untreated ginned cottonseed (n=15) and treated ginned cottonseed (n=10).

Study summary: The submitted residue data for cottonseed are adequate to support Section 24(c) registrations. The combined residues of mancozeb and ETU did not exceed the established

tolerance of 0.5 ppm in/on cottonseed harvested 128-161 days following a single in-furrow application of the 75% DF formulation made at planting at 2.27-3.27 lb ai/A (~1x the maximum registered seasonal rate for in-furrow application). Residues of mancozeb and ETU in/on all samples of treated ginned cottonseed were each nondetectable (<0.02 ppm for mancozeb and <0.01 ppm for ETU). These data will support the uses of mancozeb registered under FIFRA Section 24(c) for MS930002 and will also be extended to support AR930005, AR930006, and LA940001. Residue data for cotton gin byproducts, resulting from in-furrow application, were not included in the current submission; these data remain outstanding.

To support current Section 3 registrations of mancozeb on cotton, reregistration residue data requirements for undelinted cottonseed and cotton gin byproducts remain outstanding as specified in the Agency 1/23/96 protocol review.

Cranberry

Established tolerance: A tolerance of 7.0 ppm has been established for residues of the fungicide mancozeb, a coordination product of zinc ion and maneb (manganous ethylene bisdithiocarbamate) containing 20 percent manganese, 2.5 percent zinc, and 77.5 percent ethylene-bisdithiocarbamate (the whole product calculated as zinc ethylenebisdithiocarbamate) in/on cranberries [40 CFR §180.176].

Use patterns registered to members of the Mancozeb Task Force: There are several mancozeb end-use products registered to the Mancozeb Task Force which are permitted for use on cranberries; these products are listed in Table 7.

Table 7. Mancozeb EPs registered to the Mancozeb Task Force which are permitted for use on cranberries.

EPA Reg. No.	Formulation	Label Acceptance Date	Product Name
Rohm and Haas Company			
707-78	80% WP	9/30/98	Dithane M-45® Agricultural Fungicide
707-156	4 lb/gal FIC	12/9/99	Dithane F-45® Flowable Mancozeb Agricultural Fungicide
707-162	3.48 lb/gal FIC	10/11/94	Dithane M-45® Flowable M Agricultural Fungicide
707-179	70% DF	10/11/94	Dithane® DF/70 Agricultural Fungicide
707-180	75% DF	8/15/97	Dithane DF® Agricultural Fungicide
707-241	80% WP	8/15/97	Dithane® WSP Agricultural Fungicide
Griffin Corporation (mancozeb products transferred from E. I. du Pont de Nemours and Co.)			
1812-360	15% DF	12/19/97	ManKocide® Fungicide/Bactericide
1812-414	75% DF	10/9/98	Manzate® 200 DF Fungicide
1812-415	80% WP	10/28/99	Manzate® 200 Fungicide
1812-416	4 lb/gal FIC	10/9/98	Manzate® 200 Flowable Fungicide
Elf Atochem North America, Inc.			
4581-358	80% WP	8/31/99	Penncozeb® 80WP Fungicide
4581-370	75% DF	8/31/99	Penncozeb® 75DF 75% Dry Flowable Fungicide

The 80% WP, the 15%, 70% and 75% DF, and the 3.48 and 4 lb/gal FIC formulations are registered for a maximum single application rate of 4.8 lb ai/A, a maximum of three foliar applications or 14.4 lb ai/A/season, with retreatment intervals of 7-10 days, using ground or aerial equipment. Applications are to be made in a minimum of 2-3 gal/A of water when using aerial equipment; aerial applications in CA are to be made in a minimum of 5 gal/A (Rohm and Haas products only). Applications are to be made in a minimum of 20 gal/A of water when using ground equipment (Griffin products only). For all other products, a minimum application volume for ground equipment is not specified. A 30-day PHI has been established. HED notes that mancozeb uses on cranberry, as registered to the members of the Mancozeb Task Force, reflect the maximum use pattern cited in the EBDC PD 4 as well as the HED protocol review.

Reregistration requirements as per 1/23/96 protocol review: One additional cranberry field trial is required in Region 5.

Discussion of data (1998; MRID 44725701): One field trial was conducted during the 1996 growing season in WI (Region V). Cranberries were treated with three foliar broadcast applications, with 7- to 8-day retreatment intervals, of the 75% DF formulation (EPA Reg. No. 707-180) at 4.85-4.90 lb ai/A/application (14.4 lb ai/A/season; ~1x the maximum registered

seasonal rate). Applications were made in 20 gal/A of water using ground equipment. Cranberries were harvested 30 days following the final application.

One control and one treated sample of cranberries were collected from the test plot using a commercial hand rake. Although this is a normal commercial practice within this region, the registrant notes that the vast majority of cranberries grown in the U.S. are harvested by the practice of flooding cranberry bogs. The use of the commercial rake is anticipated to provide the worst case scenario, as the amount of residues on harvested cranberries held in flooded bogs would likely be reduced. Information pertaining to handling and storage procedures of harvested samples is found in "Storage Stability Data" section of this document. The harvested samples were analyzed for residues of mancozeb and ETU using the methods described in "Residue Analytical Methods" section. Apparent residues of mancozeb and ETU were each less than the LOQs (<0.05 ppm and <0.01 ppm, respectively) in/on one sample of untreated cranberries. The results of the field study are presented in Table 8.

Table 8. Residues of mancozeb and ETU in/on cranberries harvested 30 days following the last of three foliar applications of the 75% DF formulation at 4.85-4.9 lb ai/A/application (~1x the maximum seasonal rate).

Commodity	Test State	PHI, ^a days	Residues (ppm) ^b		
			Mancozeb	ETU	Combined
Cranberry	WI	30	6.19, 6.72	0.03, 0.03	6.22, 6.75

^a PHI = Preharvest interval.

^b Residues were not corrected for concurrent method recovery.

Geographic representation of data: Geographic representation of data is adequate. The protocol review specified that one cranberry trial be conducted in Region 5. In the current submission, one cranberry trial was conducted in Region 5 (WI).

Study summary: The submitted residue data for cranberry are acceptable. The combined residues of mancozeb and ETU did not exceed the established tolerance of 7.0 ppm in/on cranberries harvested 30 days following the last of three foliar broadcast applications, with 7-8 day retreatment intervals, of the 75% DF formulation at 4.85-4.90 lb ai/A/application (14.4 lb ai/A/season; ~1x). The combined residues of mancozeb and ETU in/on a single sample of treated cranberries were 6.22-6.75 ppm.

Residue data reviewed in the Mancozeb Update indicate that the combined residues of mancozeb and ETU in/on cranberries, harvested 30 days following the last of four foliar broadcast applications of the 80% WP formulation at 4.8 lb ai/A/application (1x) were 4.76 and 4.96 ppm. Residue data reviewed in the Residue Chemistry Science Chapter of the Guidance Document approximating the PD 4 use pattern indicate that the combined residues of mancozeb and ETU will not exceed the established 7 ppm tolerance for cranberries. Based on the aggregate of data

reflecting ~1x, HED concludes that the established mancozeb tolerance for cranberries is appropriate.

Grape

Established tolerance: A tolerance of 7.0 ppm has been established for residues of the fungicide mancozeb, a coordination product of zinc ion and maneb (manganous ethylene bisdithiocarbamate) containing 20 percent manganese, 2.5 percent zinc, and 77.5 percent ethylene-bisdithiocarbamate (the whole product calculated as zinc ethylenebisdithiocarbamate) in/on grapes [40 CFR §180.176].

Use patterns registered to members of the Mancozeb Task Force: There are several mancozeb end-use products registered to the Mancozeb Task Force which are permitted for use on grapes; these products are listed in Table 9.

Table 9. Mancozeb EPs registered to the Mancozeb Task Force which are permitted for use on grapes.

EPA Reg. No.	Formulation	Label Acceptance Date	Product Name
Rohm and Haas Company			
707-78	80% WP	9/30/98	Dithane —45® Agricultural Fungicide
707-156	4 lb/gal FIC	12/9/99	Dithane F-45® Flowable Mancozeb Agricultural Fungicide
707-162	3.48 lb/gal FIC	10/11/94	Dithane —45® Flowable M Agricultural Fungicide
707-179	70% DF	10/11/94	Dithane® DF/70 Agricultural Fungicide
707-180	75% DF	8/15/97	Dithane DF® Agricultural Fungicide
707-235	60% WP	6/19/97	Maximum® WP Agricultural Fungicide
707-241	80% WP	8/15/97	Dithane® WSP Agricultural Fungicide
Griffin Corporation (mancozeb products transferred from E. I. du Pont de Nemours and Co.)			
1812-360	15% DF	12/19/97	ManKocide® Fungicide/Bactericide
1812-414	75% DF	10/9/98	Manzate® 200 DF Fungicide
1812-415	80% WP	10/28/99	Manzate® 200 Fungicide
1812-416	4 lb/gal FIC	10/9/98	Manzate® 200 Flowable Fungicide
Elf Atochem North America, Inc.			
4581-358	80% WP	8/31/99	Penncozeb® 80WP Fungicide
4581-370	75% DF	8/31/99	Penncozeb® 75DF 75% Dry Flowable Fungicide

Two distinct uses of mancozeb are registered for use on grapes based on geographic location, one for East of the Rocky Mountains and another one for West of the Rocky Mountains except in CA.

For use West of the Rocky Mountains, the 80% WP, the 70% and 75% DF, and the 3.48 lb/gal and 4 lb/gal FIC formulations are registered for a maximum single application rate of 2.0 lb ai/A, a maximum of three foliar applications or 6 lb ai/A/season. For use East of the Rocky Mountains, the same formulations are registered for a maximum single application rate of 3.2 lb ai/A, a maximum of six applications or 19.2 lb ai/A/season. Applications may begin when new shoots are 0.5 to 1.5 inches long, repeated when shoots are 3-5 inches long and 8-10 inches long, and then at 7- to 10-day intervals until fruit is set. In CA, application after bloom is prohibited. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 2 gal/A of water when using aerial equipment; aerial applications in CA are to be made in a minimum of 5 gal/A (Rohm and Haas products only). Applications are to be made in a minimum of 20 gal/A of water when using ground equipment (Griffin products only). For all other products, a minimum application volume for ground equipment is not specified. A 66-day PHI has been established for areas other than CA.

The 60% WP formulation is registered for a maximum single application rate of 1.8 lb ai/A, a maximum of three foliar applications or 6 lb ai/A/season for areas west of the Rocky Mountains. The same formulation is registered for a maximum single application rate of 3.0 lb ai/A, a maximum of six applications or 18.5 lb ai/A/season for areas east of the Rocky Mountains. Applications may begin when new shoots are 0.5 to 1.5 inches long, repeated when shoots are 3-5 inches long and 8-10 inches long, and then at 7- to 10-day intervals until fruit is set. In CA, application after bloom is prohibited. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 10 gal/A of water when using aerial equipment. A minimum application volume for ground equipment is not specified. A 66-day PHI has been established for areas other than CA.

The 15% DF formulation is registered for dormant, delayed dormant, and foliar applications at a maximum single application rate of 0.375 lb ai/A and a maximum seasonal rate of 6 lb ai/A/season for areas west of the Rocky Mountains or 19.2 lb ai/A/season for areas east of the Rocky Mountains. Applications may begin at late dormant, or bud break, and repeated when new shoots are 0.5 to 1.5 inches long, 3-5 inches long and 8-10 inches long, and then at 7- to 10-day intervals until fruit is set. For moderate to severe disease pressure, applications may be repeated every 3 to 7 days. In CA, application after bloom is prohibited. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 3 gal/A of water when using aerial equipment. Applications are to be made in a minimum of 100 gal/A of water when using traditional airblast sprayers and a minimum of 25 gal/A using low volume airblast sprayers. A 66-day PHI has been established.

HED notes that mancozeb uses on grape, as registered to the members of the Mancozeb Task Force, reflect the maximum use pattern cited in the EBDC PD 4 as well as the HED protocol review.

Reregistration requirements as per 1/23/96 protocol review: Three additional grape field trials are required, two in Region 1 and one in Region 11.

Discussion of data (1998; MRID 44730801): Three field trials were conducted during the 1996 growing season in ID (Region 11) and NY and PA (Region 1). For trials conducted in NY and PA, grapes were treated with six foliar broadcast applications, with 6- to 7-day retreatment intervals, of the 75% DF formulation (EPA Reg. No. 707-180) at 3.1-3.4 lb ai/A/application (19.48 lb ai/A/season; ~1x the maximum registered seasonal rate). For the trial conducted in ID, grapes were treated with three foliar broadcast applications, with 7- to 8-day retreatment intervals, of the 75% DF formulation at 2.0 lb ai/A/application (6.08 lb ai/A/season; ~1x the maximum registered seasonal rate). Applications were made in 87-104.1 gal/A of water using ground equipment. Grapes were harvested 66 days following the final application.

One control and duplicate treated samples of grapes were collected by hand from each test plot. Information pertaining to handling and storage procedures of harvested samples is found in "Storage Stability Data" section of this document. The harvested samples were analyzed for residues of mancozeb and ETU using the methods described in "Residue Analytical Methods" section. Apparent residues of mancozeb and ETU were each less than the LOQs (<0.05 ppm and <0.01 ppm, respectively) in/on three samples of untreated grapes. The results of the grape field study are presented in Table 10.

Table 10. Residues of mancozeb and ETU in/on grapes harvested 66 days following the last of either six or three foliar applications of the 75% DF formulation.

Commodity	Test State	PHI, ^a days	Residues (ppm) ^b		
			Mancozeb	ETU	Combined
Six foliar applications at 3.1-3.4 lb ai/A/application (~ 1x the maximum seasonal rate for states east of the Rocky Mountains)					
Grape	NY	66	0.631, 0.782	<0.01, <0.01	<0.641, <0.792
	PA	66	0.115, 0.116	<0.01, <0.01	<0.125, <0.126
Three foliar applications at 2.0 lb ai/A/application (~ 1x the maximum seasonal rate for states west of the Rocky Mountains)					
Grape	ID	66	0.416, 0.432	<0.01, <0.01	<0.426, <0.442

^a PHI = Preharvest interval.

^b Residues were not corrected for concurrent method recovery.

Geographic representation of data: Geographic representation of data is adequate. The protocol review specified that three grape trials be conducted in Regions 1 (2 trials) and 11 (1 trial). In the current submission, three grape trials were conducted in Regions 1 (NY and PA; 2 trials) and 11 (ID; 1 trial).

Study summary: The submitted residue data for grape are acceptable. The combined residues of mancozeb and ETU did not exceed the established tolerance of 7.0 ppm in/on grapes harvested 66 days following the last of either (i) six foliar broadcast applications, with 6- to 7-day retreatment intervals, of the 75% DF formulation at 3.1-3.4 lb ai/A/application (19.48 lb

ai/A/season; ~1x the maximum seasonal rate for states east of the Rocky Mountains), or (ii) three foliar broadcast applications, with 7- to 8-day retreatment intervals, of the 75% DF formulation at 2.0 lb ai/A/application (6.08 lb ai/A/season; ~1x the maximum seasonal rate for states west of the Rocky Mountains). The combined residues of mancozeb and ETU in/on duplicate samples of treated grapes were <0.125-<0.792 ppm.

Data reviewed in the Mancozeb Update indicate that residues in/on grapes, harvested 66 days following the last of four foliar broadcast applications of the 80% WP formulation at 3.2 lb ai/A/application (~2x maximum seasonal rate for states west of the Rocky Mountains) were 0.38-1.65 ppm for mancozeb and <0.01-0.03 ppm for ETU. Residues in/on grapes, harvested 66 days following the last of 4 or 5 applications of the 80% WP formulation at 3.2 lb ai/A/application (~0.7-0.8x maximum seasonal rate for states east of the Rocky Mountains) were 0.41-1.83 ppm for mancozeb and <0.01-0.04 ppm for ETU. Based on the aggregate of data reflecting ~1x, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on grapes be reassessed from 7.0 to 2.0 ppm.

Onion, dry bulb

Established tolerance: A tolerance of 0.5 ppm has been established for residues of the fungicide mancozeb, a coordination product of zinc ion and maneb (manganous ethylene bisdithiocarbamate) containing 20 percent manganese, 2.5 percent zinc, and 77.5 percent ethylene-bisdithiocarbamate (the whole product calculated as zinc ethylenebisdithiocarbamate) in/on onion (dry bulb) [40 CFR §180.176].

Use patterns registered to members of the Mancozeb Task Force: There are several mancozeb end-use products registered to the Mancozeb Task Force which are permitted for use on onions; these products are listed in Table 11.

Table 11. Mancozeb EPs registered to the Mancozeb Task Force which are permitted for use on dry bulb onions.

EPA Reg. No.	Formulation	Label Acceptance Date	Product Name
Rohm and Haas Company			
707-78	80% WP	9/30/98	Dithane M-45® Agricultural Fungicide
707-156	4 lb/gal FIC	12/9/99	Dithane F-45® Flowable Mancozeb Agricultural Fungicide
707-162	3.48 lb/gal FIC	10/11/94	Dithane M-45® Flowable M Agricultural Fungicide
707-179	70% DF	10/11/94	Dithane® DF/70 Agricultural Fungicide
707-180	75% DF	8/15/97	Dithane DF® Agricultural Fungicide
707-241	80% WP	8/15/97	Dithane® WSP Agricultural Fungicide
Griffin Corporation (mancozeb products transferred from E. I. du Pont de Nemours and Co.)			
1812-360	15% DF	12/19/97	ManKocide® Fungicide/Bactericide
1812-414	75% DF	10/9/98	Manzate® 200 DF Fungicide
1812-416	4 lb/gal FIC	10/9/98	Manzate® 200 Flowable Fungicide
Elf Atochem North America, Inc.			
4581-358	80% WP	8/31/99	Penncozeb® 80WP Fungicide
4581-370	75% DF	8/31/99	Penncozeb® 75DF 75% Dry Flowable Fungicide

The 80% WP, the 70% and 75% DF, and the 3.48 lb/gal and 4 lb/gal FIC formulations are registered for a maximum single application rate of 2.4 lb ai/A, a maximum of 10 foliar applications or 24 lb ai/A/season. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 2 gal/A of water when using aerial equipment; aerial applications in CA are to be made in a minimum of 5 gal/A (Rohm and Haas products only). Applications are to be made in a minimum of 20 gal/A of water when using ground equipment (Griffin products only). For all other products, a minimum application volume for ground equipment is not specified. A 7-day PHI has been established.

The 15% DF formulation is registered for a maximum single application rate of 0.375 lb ai/A or 24 lb ai/A/season. Applications may be made using ground or aerial equipment. Applications are to be made in minimums of 3 gal/A of water for aerial equipment, 100 gal/A of water for traditional airblast sprayers, and 25 gal/A for low volume airblast sprayers. A 7-day PHI has been established.

In addition, the 80% WP, 70% and 75% DF, and 3.48 lb/gal and 4 lb/gal FIC formulations are registered for a single in-furrow drench application at 2.4 lb ai/A made at planting using ground equipment. Applications are to be made in 75-125 gal/A of water. Use is prohibited in CA (Rohm and Haas and Elf Atochem products only). No PHI has been specified.

Reregistration requirements as per 1/23/96 protocol review: Three additional onion field trials are required, one in Region 8, one in Region 10, and one in Region 11 or 12.

Discussion of data (1998; MRID 44725501): Three field trials were conducted during the 1996 growing season in CA (Region 10), OR (Region 12), and TX (Region 8). Onions were treated with 10 foliar broadcast applications, with 6- to 8-day retreatment intervals, of the 75% DF formulation (EPA Reg. No. 707-180) at 2.3-2.8 lb ai/A/application (24.14-24.34 lb ai/A/season; ~1x the maximum registered seasonal rate). Applications were made in 19.8-50.36 gal/A of water using ground equipment. Onions were harvested 7 days following the final application.

Control and treated samples of mature onions (12-24 bulbs per sample) were collected by hand from each test plot. Information pertaining to handling and storage procedures of harvested samples is found in "Storage Stability Data" section of this document. The harvested samples were analyzed for residues of mancozeb and ETU using the methods described in "Residue Analytical Methods" section. Apparent residues of mancozeb and ETU were each less than the LOQs (<0.4 ppm and <0.01 ppm, respectively) in/on three samples of untreated onions. The results of the field study are presented in Table 12.

Table 12. Residues of mancozeb and ETU in/on dry bulb onions harvested 7 days following the last of ten foliar applications of the 75% DF formulation at 2.3-2.8 lb ai/A/application.

Commodity	Test State	PHI, ^a days	Residues (ppm) ^b		
			Mancozeb	ETU	Combined
Onion, dry bulb	CA	7	0.41, 0.72	<0.01, <0.01	<0.42, <0.73
	OR	7	1.37, 1.79	<0.01, <0.01	<1.38, <1.80
	TX	7	<0.40, <0.40	<0.01, <0.01	<0.41, <0.41

^a PHI = Preharvest interval.

^b Residues were not corrected for concurrent method recovery.

Geographic representation of data: Geographic representation of data is adequate. The protocol review specified that three onion trials be conducted in Regions 8 (1 trial), 10 (1 trial), and 11/12 (1 trial). In the current submission, three onion trials were conducted in Regions 8 (TX; 1 trial), 10 (CA; 1 trial), and 12 (OR; 1 trial).

Study summary: Pending receipt of acceptable storage stability data, the submitted residue data for dry bulb onions are acceptable. The combined residues of mancozeb and ETU exceeded the established tolerance of 0.5 ppm in/on dry bulb onions harvested 7 days following the last of 10 foliar broadcast applications, with 6- to 8-day retreatment intervals, of the 75% DF formulation at 2.3-2.8 lb ai/A/application (24.14-24.34 lb ai/A/season; ~1x). The combined residues of mancozeb and ETU in/on samples of treated onions were <0.41-<1.80 ppm.

Residue data reviewed in the Mancozeb Update indicate that residues in/on onions, harvested 7 days following the last of 10 foliar broadcast applications of the 80% WP formulation at 2.4 lb ai/A/application (1x maximum seasonal rate) were 0.051-0.068 ppm for mancozeb and 0.013-0.017 ppm for ETU. The available onion data suggest that a higher mancozeb tolerance may be needed to support the use pattern eligible for reregistration. The Agency will reassess the mancozeb tolerance on dry bulb onions when the requested supporting storage stability data have been submitted and evaluated.

Pear

Established tolerance: A tolerance of 10 ppm has been established for residues of the fungicide mancozeb, a coordination product of zinc ion and maneb (manganous ethylene bisdithiocarbamate) containing 20 percent manganese, 2.5 percent zinc, and 77.5 percent ethylene-bisdithiocarbamate (the whole product calculated as zinc ethylenebisdithiocarbamate) in/on pear [40 CFR §180.176].

Use patterns registered to members of the Mancozeb Task Force: There are several mancozeb end-use products registered to the Mancozeb Task Force which are permitted for use on pears; these products are listed in Table 13.

Table 13. Mancozeb EPs registered to the Mancozeb Task Force which are permitted for use on pears.

EPA Reg. No.	Formulation	Label Acceptance Date	Product Name
Rohm and Haas Company			
707-78	80% WP	9/30/98	Dithane M-45® Agricultural Fungicide
707-156	4 lb/gal FIC	12/9/99	Dithane F-45® Flowable Mancozeb Agricultural Fungicide
707-162	3.48 lb/gal FIC	10/11/94	Dithane M-45® Flowable M Agricultural Fungicide
707-179	70% DF	10/11/94	Dithane® DF/70 Agricultural Fungicide
707-180	75% DF	8/15/97	Dithane DF® Agricultural Fungicide
707-241	80% WP	8/15/97	Dithane® WSP Agricultural Fungicide
Griffin Corporation (mancozeb products transferred from E. I. du Pont de Nemours and Co.)			
1812-360	15% DF	12/19/97	ManKocide® Fungicide/Bactericide
1812-414 (transferred from 352-449)	75% DF	10/9/98	Manzate® 200 DF Fungicide
1812-415 (transferred from 352-341)	80% WP	10/28/99	Manzate® 200 Fungicide
1812-416 (transferred from 352-398)	4 lb/gal FIC	10/9/98	Manzate® 200 Flowable Fungicide

Elf Atochem North America, Inc.			
4581-358	80% WP	3/31/99	Penncozeb® 80WP Fungicide
4581-370	75% DF	3/31/99	Penncozeb® 75DF 75% Dry Flowable Fungicide

Two distinct treatment schedules are registered for mancozeb use on pears, a prebloom and an extended use pattern. The prebloom and extended treatment schedules are not to be combined.

For the prebloom treatment schedule, the 80% WP, the 70% and 75% DF, and the 3.48 lb/gal and 4 lb/gal FIC formulations are registered for a maximum single application rate of 4.8 lb ai/A, a maximum of four prebloom/bloom applications or 19.2 lb ai/A/season. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 2 gal/A or 10 gal/A (Elf Atochem products only) of water when using aerial equipment; aerial applications in CA are to be made in a minimum of 5 gal/A (Rohm and Haas products only). Applications are to be made in a minimum of 50 gal/A of water when using ground equipment (Griffin products only). For all other products, a minimum application volume for ground equipment is not specified. A PHI has not been established for the prebloom use pattern. The grazing of livestock in treated areas is prohibited.

For the extended treatment schedule, the 80% WP, the 70% and 75% DF, and the 3.48 lb/gal and 4 lb/gal FIC formulations are registered for a maximum single application rate of 2.4 lb ai/A, a maximum of seven extended foliar applications or 16.8 lb ai/A/season. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 2 gal/A or 10 gal/A (Elf Atochem products only) of water when using aerial equipment; aerial applications in CA are to be made in a minimum of 5 gal/A (Rohm and Haas products only). Applications are to be made in a minimum of 50 gal/A of water when using ground equipment (Griffin products only). For all other products, a minimum application volume for ground equipment is not specified. A PHI of 77 days has been established for the extended foliar use pattern. The grazing of livestock in treated areas is prohibited. HED notes that mancozeb uses on pears, as registered to the members of the Mancozeb Task Force, reflect the maximum use pattern cited in the EBDC PD 4 as well as the HED protocol review.

In addition, the 15% DF formulation is registered for applications to be made at bloom at a maximum single application rate of 0.225 lb ai/A or 19.2 lb ai/A/season. For control of *Pseudomonas* blight, the 15% DF is also registered for multiple dormant applications at 2.4 lb ai/A/application or 19.2 lb ai/A/season. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 3 gal/A of water when using aerial equipment. Applications are to be made in a minimum of 100 gal/A of water when using traditional airblast sprayers and a minimum of 25 gal/A using low volume airblast sprayers. A PHI has not been established for the bloom or dormant use pattern. The grazing of livestock in treated areas is prohibited.

Reregistration requirements as per 1/23/96 protocol review: Five additional pear trials are required for pears, two in Region 10 and three in Region 11.

Discussion of data (1998; MRID 44725901): Five field trials were conducted during the 1996 growing season in CA (2 trials; Region 10) and ID, OR, and WA (1 trial each; Region 11). Each test site consisted of one control plot and three treatment plots to represent three treatment schedules. In the first treatment schedule, mature pears were harvested 108-128 days following the last of four prebloom/bloom applications, with 7- to 10-day retreatment intervals, of the 75% DF formulation (EPA Reg. No. 707-180) at 4.7-5.1 lb ai/A/application (18.97-19.69 lb ai/A/season; 1x the maximum registered seasonal rate for prebloom applications). For the second treatment schedule, mature pears were harvested 77 days following the last of seven foliar broadcast applications, with 7- to 10-day retreatment intervals, of the 75% DF formulation at 2.3-2.5 lb ai/A/application (16.74-16.95 lb ai/A/season; 1x the maximum registered seasonal rate for extended foliar applications). For the third treatment schedule, mature pears were harvested 77 days following the last of five prebloom, bloom, and post bloom applications of the 75% DF formulation at 6.2-6.7 lb ai/A/application (31.88-32.57 lb ai/A/season), with 7- to 10-day retreatment intervals for the first three applications and the last two applications were evenly spaced. Applications were made in 84.11-103.36 gal/A of water using ground equipment.

One control and replicate treated samples of pears were collected by hand from each test plot at each test site. Information pertaining to handling and storage procedures of harvested samples is found in "Storage Stability Data" section of this document. The harvested samples were analyzed for residues of mancozeb and ETU using the methods described in "Residue Analytical Methods" section. Apparent residues of mancozeb and ETU were each less than the LOQs (<0.05 ppm and <0.01 ppm, respectively) in/on five samples of untreated pears. The results of the field study are presented in Table 14.

Table 14. Residues of mancozeb and ETU in/on pears following multiple applications of the 75% DF formulation.

Commodity	Test State	PHI, ^a days	Residues (ppm) ^b		
			Mancozeb	ETU	Combined
<u>Treatment regime 1:</u> Four prebloom/bloom/post bloom applications at 4.7-5.1 lb ai/A/application (~ 1x the maximum seasonal rate for prebloom applications)					
Pear	CA	108	0.08, 0.10	<0.01, <0.01	<0.09, <0.11
	CA	108	0.12, 0.13	<0.01, <0.01	<0.13, <0.14
	ID	129	0.06, 0.09	<0.01, <0.01	<0.07, <0.10
	OR	112	0.06, 0.11	<0.01, <0.01	<0.07, <0.12
	WA	128	0.10, 0.13	<0.01, <0.01	<0.11, <0.14
<u>Treatment regime 2:</u> Seven foliar applications at 2.3-2.5 lb ai/A/application (~ 1x the maximum seasonal rate for extended foliar applications)					
Pear	CA	77	0.10, 0.22	<0.01, <0.01	<0.11, <0.23
	CA	77	0.29, 0.31	<0.01, <0.01	<0.30, <0.32
	ID	77	0.42, 0.50	<0.01, <0.01	<0.43, <0.51
	OR	77	0.19, 0.22	<0.01, <0.01	<0.20, <0.23
	WA	77	0.48, 0.65	<0.01, <0.01	<0.49, <0.66
<u>Treatment regime 3:</u> Five prebloom/bloom applications at 6.2-6.7 lb ai/A/application					
Pear	CA	77	0.33, 0.77	0.01, 0.01	0.34, 0.78
	CA	77	0.60, 1.0	0.02, <0.01	0.62, <1.01
	ID	77	0.61, 0.70	<0.01, <0.01	<0.62, <0.71
	OR	77	0.33, 0.35	<0.01, <0.01	<0.34, <0.36
	WA	77	0.41, 0.71	<0.01, <0.01	<0.42, <0.72

^a PHI = Preharvest interval.^b Residues were not corrected for concurrent method recovery.

Geographic representation of data: Geographic representation of data is adequate. The protocol review specified that five pear trials be conducted in Regions 10 (2 trials) and 11 (3 trials). In the current submission, five pear trials were conducted in Regions 10 (CA; 2 trials) and 11 (ID, OR, and WA; 3 trials).

Study summary: The submitted residue data for pears are acceptable. The combined residues of mancozeb and ETU did not exceed the established tolerance of 10 ppm in/on mature pears following multiple applications of the 75% DF formulation according to these three treatment schedules: (i) schedule 1 - four prebloom/bloom/post bloom applications at 4.7-5.1 lb ai/A/application (18.97-19.69 lb ai/A/season; ~1x the maximum seasonal rate for prebloom applications) and PHIs of 108-129 days; (ii) schedule 2 - seven foliar applications at 2.3-2.5 lb ai/A/application (16.74-16.95 lb ai/A/season; ~1x the maximum seasonal rate for extended foliar applications) and a 77-day PHI; and (iii) schedule 3 - five prebloom/bloom applications at 6.2-6.7 lb ai/A/application (31.88-32.57 lb ai/A/season) and a 77-day PHI. The ranges of combined

residues of mancozeb and ETU in/on treated samples were <0.07-<0.14, <0.11-<0.66, and <0.34-<1.01 ppm from schedules 1, 2, and 3 respectively.

Residue data reviewed in the Mancozeb Update were conducted at exaggerated rates and do not reflect the use pattern being supported for reregistration. Based on residue data from the current submission, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on pears be reassessed from 10.0 to 1.0 ppm.

Sugar beet, roots and tops

Established tolerances: Tolerances of 2 and 65 ppm have been established for residues of the fungicide mancozeb, a coordination product of zinc ion and maneb (manganous ethylene bisdithiocarbamate) containing 20 percent manganese, 2.5 percent zinc, and 77.5 percent ethylene-bisdithiocarbamate (the whole product calculated as zinc ethylenebisdithiocarbamate) in/on sugar beet roots and tops, respectively [40 CFR §180.176].

Use patterns registered to members of the Mancozeb Task Force: There are several mancozeb end-use products registered to the Mancozeb Task Force which are permitted for use on sugar beets; these products are listed in Table 15.

Table 15. Mancozeb EPs registered to the Mancozeb Task Force which are permitted for use on sugar beets.

EPA Reg. No.	Formulation	Label Acceptance Date	Product Name
Rohm and Haas Company			
707-78	80% WP	9/30/98	Dithane M-45® Agricultural Fungicide
707-156	4 lb/gal FIC	12/9/99	Dithane F-45® Flowable Mancozeb Agricultural Fungicide
707-162	3.48 lb/gal FIC	10/11/94	Dithane M-45® Flowable M Agricultural Fungicide
707-179	70% DF	10/11/94	Dithane® DF/70 Agricultural Fungicide
707-180	75% DF	8/15/97	Dithane DF® Agricultural Fungicide
707-241	80% WP	8/15/97	Dithane® WSP Agricultural Fungicide
Griffin Corporation (mancozeb products transferred from E. I. du Pont de Nemours and Co.)			
1812-360	15% DF	12/19/97	ManKocide® Fungicide/Bactericide
1812-414	75% DF	10/9/98	Manzate® 200 DF Fungicide
1812-415	80% WP	10/28/99	Manzate® 200 Fungicide
1812-416	4 lb/gal FIC	10/9/98	Manzate® 200 Flowable Fungicide
Elf Atochem North America, Inc.			
4581-358	80% WP	8/31/99	Penncozeb® 80WP Fungicide
4581-370	75% DF	8/31/99	Penncozeb® 75DF 75% Dry Flowable Fungicide

The 80% WP, the 70% and 75% DF, and the 3.48 lb/gal and 4 lb/gal FIC formulations are registered for a maximum single application rate of 1.6 lb ai/A, a maximum of seven applications or 11.2 lb ai/A/season. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 2 gal/A of water when using aerial equipment; aerial applications in CA are to be made in a minimum of 5 gal/A (Rohm and Haas products only). Applications are to be made in a minimum of 20 gal/A of water when using ground equipment (Griffin products only). For all other products, a minimum application volume for ground equipment is not specified. A PHI of 14 days has been established. The feeding of treated tops to livestock is prohibited. HED notes that the above mancozeb uses on sugar beets, as registered to the members of the Mancozeb Task Force, reflect the maximum use pattern cited in the EBDC PD 4 as well as the HED protocol review.

In addition, the 15% DF formulation is registered for multiple foliar applications to be made at a maximum application rate of 0.975 lb ai/A/application or 11.2 lb ai/A/season. Applications may be made using ground or aerial equipment. Applications are to be made in a minimum of 3 gal/A of water when using aerial equipment. Applications are to be made in a minimum of 100 gal/A of water when using traditional airblast sprayers and a minimum of 25 gal/A using low volume airblast sprayers. A 14-day PHI has been established. The feeding of treated tops to livestock is prohibited.

Reregistration requirements as per 1/23/96 protocol review: Seven additional field trials are required for sugar beets, three in Region 5 and one each in Regions 7, 8, 9, and 10. Samples of both roots and tops should be analyzed from all field trials.

Discussion of data (1998; MRID 44725101): Seven field trials were conducted during the 1996 growing season in CA (Region 10), CO (Region 9), MI (Region 5), MN (Region 5), ND (2 trials; Regions 5 and 7), and TX (Region 8). Sugar beets were treated with seven foliar broadcast applications, with 7- to 11-day retreatment intervals, of the 75% DF formulation (EPA Reg. No. 707-180) at 1.6-1.8 lb ai/A/application (11.06-11.33 lb ai/A/season; ~1x the maximum registered seasonal rate). Applications were made in 19.46-50.25 gal/A of water using ground equipment. Sugar beet roots and tops were harvested 14 days following the final application.

Control and treated samples of sugar beets (roots and tops) were collected by hand from each test plot. Information pertaining to handling and storage procedures of harvested samples is found in "Storage Stability Data" section of this document. The harvested samples were analyzed for residues of mancozeb and ETU using the methods described in "Residue Analytical Methods" section. Apparent residues of mancozeb and ETU were each less than the LOQs (<0.02 ppm and <0.01 ppm, respectively) in/on seven samples each of untreated sugar beet roots and tops. The results of the field study are presented in Table 16.

Table 16. Residues of mancozeb and ETU in/on sugar beet roots and tops harvested 14 days following the last of seven foliar applications of the 75% DF formulation at 1.56-1.75 lb ai/A/application.

Commodity	Test State	PHI, ^a days	Residues (ppm) ^b		
			Mancozeb	ETU	Combined
Sugar beet, tops	CA	14	5.36, 6.98	0.02, 0.02	5.38, 7.00
	CO	14	25.2, 31.5	0.05, 0.07	25.25, 31.57
	MI	14	13.6, 20.7	0.04, 0.04	13.64, 20.74
	MN	14	3.65, 4.52	0.01, 0.01	3.66, 4.53
	ND	14	16.7, 17.2	0.10, 0.02	16.80, 17.22
	ND	14	14.7, 23.5	0.05, 0.06	14.75, 23.56
	TX	14	10.2, 12.0	0.03, 0.06	10.23, 12.06
Sugar beet, roots	CA	14	0.02, 0.02	<0.01, <0.01	<0.03, <0.03
	CO	14	0.14, 0.30	<0.01, <0.01	<0.15, <0.31
	MI	14	0.09, 0.14	<0.01, <0.01	<0.10, <0.15
	MN	14	0.06, 0.09	<0.01, <0.01	<0.07, <0.10
	ND	14	0.14, 0.17	<0.01, <0.01	<0.15, <0.18
	ND	14	0.17, 0.64	<0.01, <0.01	<0.18, <0.65
	TX	14	0.09, 0.11	<0.01, <0.01	<0.10, <0.12

^a PHI = Preharvest interval.

^b Residues were not corrected for concurrent method recovery.

Geographic representation of data: Geographic representation of data is adequate. The protocol review specified that seven sugar beet trials be conducted in Regions 5 (3 trials), 7 (1 trial), 8 (1 trial), 9 (1 trial), and 10 (1 trial). In the current submission, seven sugar beet trials were conducted in Regions 5 (MI, MN, and ND; 3 trials), 7 (ND; 1 trial), 8 (TX; 1 trial), 9 (CO; 1 trial), and 10 (CA; 1 trial).

Study summary: The submitted residue data for sugar beet roots and tops are acceptable. The combined residues of mancozeb and ETU did not exceed established tolerances of 2.0 and 65.0 ppm in/on samples of sugar beet root and tops, respectively, that were harvested 14 days following the last of seven foliar broadcast applications, with 7- to 11-day retreatment intervals, of the 75% DF formulation at 1.56-1.75 lb ai/A/application (11.06-11.33 lb ai/A/season; ~1x). The combined residues of mancozeb and ETU in/on samples of treated sugar beet roots and tops were <0.03-<0.65 ppm and 3.66-31.57 ppm, respectively.

Additional data for sugar beet root, reviewed in the Residue Chemistry Chapter of the Mancozeb Registration Standard dated 9/10/86, indicate that residues were <0.05-1.5 ppm for mancozeb and <0.01-0.029 ppm for ETU at PHIs of 6-28 days following the last of 5-8 foliar broadcast applications of the 80% WP formulation at 1.6 lb ai/A/application (~1x maximum seasonal rate). Based on the aggregate of data reflecting ~1x, HED recommends that the established tolerance

for the combined residues of mancozeb and ETU in/on sugar beet roots be reassessed at its existing level of 2.0 ppm.

Two additional studies for sugar beet tops were reviewed in the Residue Chemistry Chapter of the Mancozeb Registration Standard dated 9/10/86. In one study, residues were 95.0-99.5 ppm for mancozeb and <0.01-1.26 ppm for ETU in/on samples harvested 15 days following the last of four foliar broadcast applications of the 80% WP formulation at 1.6 lb ai/A/application (1x maximum single application rate, 0.6x the maximum seasonal application rate allowed by PD 4). In another study, residues were 2.8-20.0 ppm for mancozeb and <0.01-0.042 ppm for ETU in/on samples harvested 7-28 days following the last of 6-7 foliar broadcast applications of the 80% WP formulation at 1.6 lb ai/A/application (~1x maximum seasonal rate allowed by the PD 4). Based on the aggregate of data reflecting ~1x, HED recommends that the established tolerance for the combined residues of mancozeb and ETU in/on sugar beet tops be reassessed from 65 ppm to 100 ppm.

AGENCY MEMORANDA CITED IN THIS REVIEW

DP Barcode: D192870
Subject: MS930002. Section 24(c) Special Local Need Registration for In-Furrow Application of Mancozeb (Dithane® F-45 Fungicide and Dithane® DF Fungicide) to Cotton in the State of Mississippi.
From: D. Davis
To: D. Greenway
Dated: 07/22/93
MRID(s): None

CBRS No.: 14373
DP Barcode: D207579
SUBJECT: Mancozeb (014504) and Metiram (014601) on Apples - Reregistration GLN 171-4(k).
FROM: S. Hummel
TO: K. Boyle
DATED: 9/6/96
MRID(s): 43357201

CBRS No.: 15792
DP Barcode: D216884
SUBJECT: Mancozeb (014504). Reregistration Case No. 0643 Mancozeb Task Force
Protocol-Field Trials on Apples, Asparagus, Bananas, Barley, Oats, Rye, Wheat,
Cotton, Cranberries, Fennel, Grapes, Onions, Papayas, Peanuts, Pears, and Sugar
Beets.
FROM: S. Hummel
TO: V. Eagle-Kunst/W. Waldrop
DATED: 1/23/96
MRID(s): None

MASTER RECORD IDENTIFICATION NUMBERS

Citations for the MRID document referred to in this review are presented below.

44038801 Leppert, B. (1996) Magnitude of Mancozeb Residues in Cotton From In-Furrow Treatment: Final Report: Lab Project Number: SARS-93-20: ML93-0431-RAH: RH. Cultural Research Services, Inc. SARS-93-20: ML93-0431-RAH: RH.1993-01. Unpublished study prepared by Stewart Agricultural Research Services, Inc. and Morse Laboratories, Inc. 413 p.

44725101 Prochaska, L. (1998) Magnitude of Mancozeb Residues in Sugar Beets: Lab Project Number: SARS-96-03: ML96-0655-MCB: SARS-96-CO-03. Unpublished study prepared by Stewart Agricultural Research Services, Inc. and Morse Laboratories, Inc. 424 p.

44725501 Prochaska, L. (1998) Magnitude of Mancozeb Residues in Onion (Dry Bulb): Final Report: Lab Project Number: ML96-0653-MCB: 63552: SARS-96-02. Unpublished study prepared by Stewart Agricultural Research Services, Inc. and Morse Laboratories, Inc. 253 p.

44725701 Koppatschek, F. (1998) Magnitude of the Residues of Mancozeb in the Raw Agricultural Commodity (RAC), the Edible Portion of Cranberries, Following Three Sequential Applications of Mancozeb at 4.8lb AI/Acre to Cranberry Plants: Lab Project Number: 96ABG0102: 96ABG102: ABG PM970102. Unpublished study prepared by Morse Laboratories, Inc. and Agri Business Group, Inc. 224 p.

44725901 Prochaska, L. (1998) Magnitude of Mancozeb Residues in Pears: Lab Project Number: 63552: SARS-96-01: ML96-0654-MCB. Unpublished study prepared by Stewart Agricultural Research Services, Inc. and Morse Laboratories, Inc. 399 p.

44726001 Koppatschek, F. (1998) Magnitude of the Residues of Mancozeb in the Raw Agricultural Commodity (RAC), Whole Bananas, Following Ten Sequential Applications of Mancozeb at 2.4lb AI/Acre to Banana Plants: Lab Project Number: 96ABG0104: 96ABG104:

ABG PM970104. Unpublished study prepared by Agri Business Group, Inc. and Morse Laboratories, Inc. 456 p.

44730801 Koppatschek, F. (1998) Magnitude of the Residues of Mancozeb in the Raw Agricultural Commodity (RAC), the Edible Portion of Grapes, Following Six Sequential Applications of Mancozeb at 2.0 lb AI/Acre to Grape Plants: Lab Project Number: 96ABG101: 96NY103: 96PA104. Unpublished study prepared by Agri Business Group, Inc., and Morse Laboratories, Inc. 266 p.